| | Project Number | Topic | Project Name | Description | Potential Countries | Analysis Type | Expected Policy Products or Recommendations | Existing PREDICT Data |
|---|---|---|---|---|---|---|---|---|
| 2 | 1 | Medium and large market value chains | **Upstream vs. local viral diversity** | Compare viral detection rates of species in markets to the same species at their sources | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Data Modeling | Recommendations whether to focus on upstream or in-market interventions to reduce spillover | PREDICT-1 viral detection data |
| 3 | 2 | Medium and large market value chains | **Assessing viral sharing within market species** | Within common or nearby markets, determining which species share viruses in order to recommend separation. Determine viral sharing both within specific markets, and for all PREDICT-1 (and other) data for species found in the same market | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Data Modeling | Recommendations for species segregation to reduce spread, | PREDICT-1 viral detection data from markets PREDICT-1 and PREDICT-2 species presence in markets |
| 4 | 3 | Medium and large market value chains | **Converting live markets to non-live** | Estimating reductions in viral density/diversity as a result of change from live to non-live markets. Compare estimated viral diversity and density in a live market to an equivalent non-live market or live market with fraction of time, volume, or species converted to non-live. | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Mixed Data Modeling/Scenario Creation | Expected degree of risk change from full conversion of markets, Expected efficacy of partial conversions and closures Identification of markets with potential for conversion | PREDICT-1 viral detection data from live and non-live samples in markets |
| 5 | 4 | Medium and large market value chains | **Reducing market biodiversity** | Estimating potential for viral recombination in markets based on species diversity and count using previously created recombination model. | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Mixed Data Modeling/Scenario Creation | Identification and ranking of markets with high recombination risk, recommendations for species segregation for those markets | PREDICT-2 Species and number of animals (live) in markets (Site and Event characterization - Main Q15) |
| 6 | 5 | Medium and large market value chains | **Will policies for market-based interventions be accepted?** | The intevention policy ideas that we are generating above, and others, may not be acceptable to governments or people within countries. This project will assess their likelihood of becoming government policy, or being adopted by people. | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Mixed Data Modeling | Recommendations that are more likely to be adopted | PREDICT-1 and PREDICT-2 behavioral risk data |
| 7 | 6 | Bat Hunting and hunted meat value chain | **Hunter Behavioral Risk Hotspots** | Identify areas with highest risk of viral spillover to hunters based on risky behavior, propensity of local bat species to carry viruses, and likelihood for bats to be sold into value chain | Bangladesh, China, DRC, Ghana, Indonesia, Nepal, RoC, Sierra Leone | Data Modeling | Target locations and behaviors for educational interventions | PREDICT-2 questionaire data on hunter behavior |
| 8 | 7 | Bat Hunting and hunted meat value chain | **Bat Hunting Seasonality** | Identify areas of bat hunting associated with high risk seasonality in bat viral detection | Bangladesh, China, DRC, Ghana, Indonesia, Nepal, RoC, Sierra Leone | Data modeling | Target locations and seasons to reduce bat hunting/drive education | PREDICT-2 questionaire data on hunter behavior PREDICT-1 viral detections |
| 9 | 8 | Ecotourism/recreational/religious exposure to bat caves | **Bat cave biodiversity risk** | Estimating potential for recombination of viruses in bat-dwelling caves | China, Malaysia, Myanmar, Rwanda, Uganda | Mixed Data Modeling/Scenario Creation | Risk characterization by cave site/size/type | |

All projects (n=16)

| Other Existing Data Assets | Non-field Data Collection | Additional Field Data Collection | Time Frame (3 mo, 6 mo, 1 yr) | Probability of Success (Low, Med High) | Action items | Point person | Collaborators |
|---|---|---|---|---|---|---|---|
| | | Market-upstream site associations from field teams | Short | | Determine what P1 cases have same species in both markets and linked upstream sources | Kevin | Evan, CKJ, Tracey, LVF, KS |
| HP3 viral associations | | More accurate species characterization and counts in identified markets of interest | Long | | Estimate data on species diversity and numbers from P2 site characterizations in market modules | CKJ (will coordinate with KJO and Anna on data from our previous efforts that might inform) | KJO, CKJ |
| | Literature review of viral survival at EHA (collected but not analyzed) | | Short | | Determine which countries are we sampling from dead animals in non-live markets. Can we identify comparable live and non-live markets? | CKJ | Lucy K (SE Asia Markets), LVF, KS |
| | | More accurate species characterization and counts in identified markets of interest | Long | | Building on Parviez' model: Estimate data on species diversity and numbers from P2 site characterizations in market modules | CKJ (to discuss plan with Shirley and Noam) | NR, KJO, CKJ, Sarah Olson, Brian Bird, Tracey |
| Surveys of current policies within country, literature review | | Targeted qualitative data and focus groups.  Interviews with Govt. agencies. | Long | | | LVF, Saba Qasmieh | Karen Saylors, Hongying Li, DJW |
| IUCN species ranges, HP3 viral risk propensities | | Country team estimation of exact bat species being hunted | Med | | Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in | Stephanie Martinez | LVF, CKJ, KJO, Anna Willoughby, Terra, Brian, Guinea |
| IUCN species ranges | | Country team estimation of exact bat species being hunted | Med | | Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in, determine whether these hunters hunt with Pteropus or Eidelon (seasonal bat species) | JKM (to discuss with Evan and Stephanie regarding overlap with hunter behavioral risk above) | KJO, CKJ, Nistara, Diego, PD, JAKM |
| HP3 and Cave bat viral sharing analysis | Find literature-based bat-specific viral sharing/recombination rates | Cave bat species diversity and composition and multiple cave sites | Long | | Identify cave sites with potential for measurement and develop sampling plan | Anna W. | KJO; Brian Bird; Kirste & Julius; Simon/Tracey |

All projects (n=16)

|   | Q | R |
|---|---|---|
| 1 | **comments** | |
| 2 | Existing data not likely super useful | |
| 3 | | need to discuss bar coding |
| 4 | Existing data not likely super useful | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | What about dog/bat hunting in Lake Zone?; Add lab people if viral finding-dependednt | |
| 9 | We havE MURONGO cave as well in TZ; | |

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 10 | 9 | Ecotourism/recreational/religious exposure to bat caves | **Bat-tourist interaction** | Survey bat caves associated with predict to estimate tourist flow and demographics, current safety measures, contact risk. Estimate reduction of risk with limitation on visitors / safety measures. | China, Malaysia, Myanmar, Rwanda, Uganda | Scenario Creation | Target caves and safety measures by cave | |
| 11 | 10 | Bat-community Interactions (including livestock) | **SADS outbreak modeling - China** | Developing and fitting model of SADS disease dynamics on chinese pig farms based on previous outbreak data | China | Scenario Creation | Recommendations for intervention in new SADS outbreaks | PREDICT-2 virus identification |
| 12 | 11 | Bat-community Interactions (including livestock) | **Bat-pig contact risk of new EIDs** | Identifying the likely mechanism for contact between SADS host bats and pigs to assess if this could be generalizable to other countries and other viruses. | China | | | |
| 13 | 12 | Bat-community Interactions (including livestock) | **Regional risk of a bat-pig outbreak** | Identify areas with swine-bat overlaps similar to SADS conditions | Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda | Similarity Analysis; ecological niche modeling? | Areas for increased surveillance and bat-livestock separation based on previous Nipah work | |
| 14 | 13 | Bat guano farming/harvesting | **Bat-harvester interaction** | Survey caves to estimate harvester populations and practices. Estimate reduction in risk with reduced or modified practices. | Cambodia, DRC, Myanmar, Thailand, Vietnam | Scenario Creation | Target caves/guano farms and safety measures by cave/guano farms | |
| 15 | 14 | Bat guano farming/harvesting | **Bat guano farming** | Determine viral survival associated with guano preparation practices | Cambodia, DRC, Myanmar, Thailand, Vietnam | Scenario Creation | Time frames and practices for guano preparation | PREDICT-1 and PREDICT-2 site data about guano harvesting, PREDICT-1 viral detections at that interface |
| 16 | 15 | Shared food resources | **Fruit bat-livestock-orchard overlap** | Identify areas most likely to have human-fruit-bat interactions using species ranges and agricultural data | Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda | Similarity Analysis | Areas for increased surveillance and bat-livestock separation based on previous Nipah work | |
| 17 | 16 | Shared food resources | **Bat-palm sap overlap** | Identify areas where bat populations and viral propensities overlap with palm sap harvesting practices | Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda | Similarity Analysis | Areas for palm sap safety interventions | |

All projects (n=16)

| | I | J | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|
| 10 | | Estimates of efficacy of safety measures from published literature | Data on visitor flow, demographics and origin. Data on current safety measures implemented Observation on tourist-bat interaction measures | Long | | ID target caves and generate a sampling plan | Stephanie Martinez | Karen Saylors, LVF, PD, Kirsten (Uganda), DJW (Tanzania) |
| 11 | High-resolution data of SADS disease mortality | Vaccination and other intervention efficacy based of PEDV | | Med | | Currently underway | Noam Ross | Cale Basaraba, China collaborators |
| 12 | | | Infrared and echolocation detection of bats on farms. | Med | | Experimental design meeting follow-up | Hongying | Guangjian, other China collaborators |
| 13 | IUCN species ranges, FAO livestock layers | Bat-swine separation policy procedures based on Nipah work | | Short | | Determine characteristics of SADS-CoV spillover locations | Shirley Chen | Carlos, Erica |
| 14 | | Estimates of efficacy of safety measures from published literature | Data on harvester numbers, frequency and duration of visits, harvets and safety practices, current safety measurements in place. | Long | | ID target caves/guano farms and generate a sampling plan | Shirley Chen | Karen Saylors, Suzan Murray, Kevin O., Tracey, Lucy |
| 15 | Viral survival lit review | | Experimental viral survival in bat feces (UCD lab) | Long | | | Tracey Goldstein | Simon, Peter, Kevin, |
| 16 | IUCN species ranges, FAO livestock layers, FAO and associated crop/orchard layers, population density maps; ; Na's work; Richard Suu-ire's project in Ghana | Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit | | Short-med | | Determine characteristics of spillover locations to drive similarity analysis, data availability review | Shirley Chen | Carlos, Erica, Nistara (DTRA-funded work identifying orchards from Satellite), JAKM (Cashews), DJW,Terra and Brian B |
| 17 | IUCN species ranges, HP3 and known  viruses hosted by bat species | Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit | | Med | | Determine whether palm sap harvesting practices data are likely to be adequate | Shirley Chen | JHE |

All projects (n=16)

| | Q | R |
|---|---|---|
| 10 | We have Murongo cave as well in TZ; Rwanda won't approve the IRB | |
| 11 | | |
| 12 | | |
| 13 | DJW and Ian if behavior/social related?;Terra & Richard data from Ghana; Consider in-country people | |
| 14 | | |
| 15 | | |
| 16 | Discuss in-country peopole | |
| 17 | Consider which countries are really harvesting sap & then build team | |

| | Topic | Project Name | Description | Potential Countries | Analysis Type | Expected Policy Products or Recommendations | Existing PREDICT Data |
|---|---|---|---|---|---|---|---|
| 2 | Shared food resources | **Fruit bat-livestock-orchard overlap** | Identify areas most likely to have human-fruit-bat interactions using species ranges and agricultural data | Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda | Similarity Analysis | Areas for increased surveillance and bat-livestock separation based on previous Nipah work | |
| 3 | Medium and large market value chains | **Converting live markets to non-live** | Estimating reductions in viral density/diversity as a result of change from live to non-live markets. Compare estimated viral diversity and density in a live market to an equivalent non-live market or live market with fraction of time, volume, or species converted to non-live. | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Mixed Data Modeling/Scenario Creation | Expected degree of risk change from full conversion of markets, Expected efficacy of partial conversions and closures Identification of markets with potential for conversion | PREDICT-1 viral detection data from live and non-live samples in markets |
| 4 | Medium and large market value chains | **Upstream vs. local viral diversity** | Compare viral detection rates of species in markets to the same species at their sources | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Data Modeling | Recommendations whether to focus on upstream or in-market interventions to reduce spillover | PREDICT-1 viral detection data |
| 5 | Bat-community Interactions (including livestock) | **Regional risk of a bat-pig outbreak** | Identify areas with swine-bat overlaps similar to SADS conditions | Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda | Similarity Analysis; ecological niche modeling? | Areas for increased surveillance and bat-livestock separation based on previous Nipah work | |
| 6 | Bat Hunting and hunted meat value chain | **Hunter Behavioral Risk Hotspots** | Identify areas with highest risk of viral spillover to hunters based on risky behavior, propensity of local bat species to carry viruses, and likelihood for bats to be sold into value chain | Bangladesh, China, DRC, Ghana, Indonesia, Nepal, RoC, Sierra Leone | Data Modeling | Target locations and behaviors for educational interventions | PREDICT-2 questionaire data on hunter behavior |
| 7 | Bat Hunting and hunted meat value chain | **Bat Hunting Seasonality** | Identify areas of bat hunting associated with high risk seasonality in bat viral detection | Bangladesh, China, DRC, Ghana, Indonesia, Nepal, RoC, Sierra Leone | Data modeling | Target locations and seasons to reduce bat hunting/drive education | PREDICT-2 questionaire data on hunter behavior PREDICT-1 viral detections |

| | Other Existing Data Assets | Non-field Data Collection | Additional Field Data Collection | Time Frame (3 mo, 6 mo, 1 yr) | Probability of Success (Low, Med High) | Action items | Point person | Collaborators |
|---|---|---|---|---|---|---|---|---|
| | H | I | J | K | L | M | N | O |
| 2 | IUCN species ranges, FAO livestock layers, FAO and associated crop/orchard layers, population density maps; ; Na's work; Richard Suu-ire's project in Ghana | Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit | | Short-med | | Determine characteristics of spillover locations to drive similarity analysis, data availability review | Brooke Watson | Carlos, Erica, Nistara (DTRA-funded work identifying orchards from Satellite), JAKM (Cashews) |
| 3 | | Literature review of viral survival at EHA (collected but not analyzed) | | Short | | Determine which countries are we sampling from dead animals in non-live markets. Can we identify comparable live and non-live markets? | CKJ | |
| 4 | | | Market-upstream site associations from field teams | Short | | Determine what P1 cases have same species in both markets and linked upstream sources | Kevin | Evan, CKJ |
| 5 | IUCN species ranges, FAO livestock layers | Bat-swine separation policy procedures based on Nipah work | | Short | | Determine characteristics of SADS-CoV spillover locations | Brooke Watson | Carlos, Erica |
| 6 | IUCN species ranges, HP3 viral risk propensities | | Country team estimation of exact bat species being hunted | Med | | Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in | CKJ | KJO, Anna Willoughby |
| 7 | IUCN species ranges | | Country team estimation of exact bat species being hunted | Med | | Pull survey data to determine locations with hunters, what species hunted and hunting behaviors engaged in, determine whether these hunters hunt with Pteropus or Eidelon (seasonal bat species) | CKJ | KJO, Evan, Nistara, Diego,PD, JAKM |

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 8 | Shared food resources | **Bat-palm sap overlap** | Identify areas where bat populations and viral propensities overlap with palm sap harvesting practices | Bangladesh, Cambodia, Cameroon, Cote d'Ivoire, DRC, Ghana, Guinea, Malaysia, Myanmar, RoC, Rwanda, Sierra Leone, Tanzania, Uganda | Similarity Analysis | Areas for palm sap safety interventions | |
| 9 | Bat-community Interactions (including livestock) | **SADS outbreak modeling - China** | Developing and fitting model of SADS disease dynamics on chinese pig farms based on previous outbreak data | China | Scenario Creation | Recommendations for intervention in new SADS outbreaks | PREDICT-2 virus identification |
| 10 | Bat-community Interactions (including livestock) | **Bat-pig contact risk of new EIDs** | Identifying the likely mechanism for contact between SADS host bats and pigs to assess if this could be generalizable to other countries and other viruses. | China | | | |
| 11 | Medium and large market value chains | **Reducing market biodiversity** | Estimating potential for viral recombination in markets based on species diversity and count using previously created recombination model. | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Mixed Data Modeling/Scenario Creation | Identification and ranking of markets with high recombination risk, recommendations for species segregation for those markets | PREDICT-2 Species and number of animals (live) in markets (Site and Event characterization - Main Q15) |
| 12 | Medium and large market value chains | **Assessing viral sharing within market species** | Within common or nearby markets, determining which species share viruses in order to recommend separation. Determine viral sharing both within specific markets, and for all PREDICT-1 (and other) data for species found in the same market | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Data Modeling | Recommendations for species segregation to reduce spread, | PREDICT-1 viral detection data from markets PREDICT-1 and PREDICT-2 species presence in markets |
| 13 | Medium and large market value chains | **Will policies for market-based interventions be accepted?** | The intevention policy ideas that we are generating above, and others, may not be acceptable to governments or people within countries. This project will assess their likelihood of becoming government policy, or being adopted by people. | Cameroon, China, DRC, Indonesia, Lao PDR, ROC, Vietnam | Mixed Data Modeling | Recommendations that are more likely to be adopted | PREDICT-1 and PREDICT-2 behavioral risk data |
| 14 | Ecotourism/recreational/religious exposure to bat caves | **Bat cave biodiversity risk** | Estimating potential for recombination of viruses in bat-dwelling caves | China, Malaysia, Myanmar, Rwanda, Uganda | Mixed Data Modeling/Scenario Creation | Risk characterization by cave site/size/type | |
| 15 | Ecotourism/recreational/religious exposure to bat caves | **Bat-tourist interaction** | Survey bat caves associated with predict to estimate tourist flow and demographics, current safety measures, contact risk. Estimate reduction of risk with limitation on visitors / safety measures. | China, Malaysia, Myanmar, Rwanda, Uganda | Scenario Creation | Target caves and safety measures by cave | |
| 16 | Bat guano farming/harvesting | **Bat-harvester interaction** | Survey caves to estimate harvester populations and practices. Estimate reduction in risk with reduced or modified practices. | Cambodia, DRC, Myanmar, Thailand, Vietnam | Scenario Creation | Target caves and safety measures by cave | |

| | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|
| 8 | IUCN species ranges, HP3 and known viruses hosted by bat species | Literature or country-level descriptions to determine specific types of fruit tree resources: map layers are general for tropical fruit | | Med | | Determine whether palm sap harvesting practices data are likely to be adequate | JHE | |
| 9 | High-resolution data of SADS disease mortality | Vaccination and other intervention efficacy based of PEDV | | Med | | Currently underway | Noam Ross, Cale Basaraba | |
| 10 | | | Infrared and echolocation detection of bats on farms. | Med | | Experimental design meeting follow-up | Hongying, Guangjian, other analytical people | |
| 11 | | | More accurate species characterization and counts in identified markets of interest | Long | | Estimate data on species diversity and numbers from P2 site characterizations in market modules | CKJ | KJO, Sarah Olson |
| 12 | HP3 viral associations | | More accurate species characterization and counts in identified markets of interest | Long | | Estimate data on species diversity and numbers from P2 site characterizations in market modules | CKJ | KJO, Alice Latinne |
| 13 | Surveys of current policies within country, literature review | | Targeted qualitative data and focus groups. Interviews with Govt. agencies. | Long | | | LVF, Saba Qasmieh | Karen Saylors, Hongying Li |
| 14 | HP3 and Cave bat viral sharing analysis | Find literature-based bat-specific viral sharing/recombination rates | Cave bat species diversity and composition and multiple cave sites | Long | | Identify cave sites with potential for measurement and develop sampling plan | KJO | Anna Willoughby |
| 15 | | Estimates of efficacy of safety measures from published literature | Data on visitor flow, demographics and origin. Data on current safety measures implemented Observation on tourist-bat interaction measures | Long | | ID target caves and generate a sampling plan | LVF | Karen Saylors, Stephanie Martinez |
| 16 | | Estimates of efficacy of safety measures from published literature | Data on harvester numbers, frequency and duration of visits, harvets and safety practices, current safety measurements in place. | Long | | ID target caves and generate a sampling plan | LVF | Karen Saylors, Suzan Murray |

|    | A | B | C | D | E | F | G |
|----|---|---|---|---|---|---|---|
| 17 | Bat guano farming/harvesting | **Bat guano farming** | Determine viral survival associated with guano preparation practices | Cambodia, DRC, Myanmar, Thailand, Vietnam | Scenario Creation | Time frames and practices for guano preparation | PREDICT-1 and PREDICT-2 site data about guano harvesting, PREDICT-1 viral detections at that interface |

| | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|
| 17 | Viral survival lit review | | Experimental viral survival in bat feces (UCD lab) | Long | | | Tracey, Jonna | Simon, Peter, Kevin, |